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Progress in Tuberculosis.—Progress in tuberculosis has not been made by imperceptible steps, but, as Adami pointed out, by sudden leaps and bounds, followed by periods of little or no change. Koch's discovery has been followed by a period of progress afforded by research. Another cycle of discovery is due, this time more in the zone of the bacteriologist than of the biochemist. At present Calmette's work affords the greatest promise, and is based upon Koch's phenomenon, described in 1891, to the effect that reinoculation in previously infected guinea pigs results in a comparatively mild reaction. In 1908 Calmette proved by experimentation that tuberculous cows are much more resistant to reinfection than normal cows. His present treatment consists in giving a dose of 1 cgm. of *BCG.* culture, obtained by attenuating virulent bovine tubercle bacilli by 230 cultures in glycerinated ox-bile, to each infant within seven days of birth. Inoculation of more than 5000 infants, from 1922 to 1925, reduced the death-rate from tuberculosis from 25 per cent to less than 2 per cent. However, some obvious objections to the extended use of *BCG.* are that it is purely prophylactic and applicable only to coming generations; it must be administered immediately after birth, before possible infection with a more virulent microörganism, and it would entail difficulty in the tuberculosis officer receiving timely notification of births, and obtaining the consent of the parents in all cases. Other products of bacteriological laboratories, promising a cure or alleviation of the disease, such as Koch's tuberculin and Spahlinger's serum, have proved disappointing. Chemotherapeutic discoveries have been very disheartening; Sanocrysin has been used with disappointing results, as also the salts of calcium, copper, bismuth, etc. Better results are recorded from the realms of physical science, as in the application of ultraviolet light in bone and joint tuberculosis in infancy. Surgery in the treatment of tuberculosis is tending to be more and more conservative. Surgeons, and in particular Sir Robert Jones, are advocating treatment by rest and appliances, rather than surgical interference with the local lesion. The surgical treatment of pulmonary tuberculosis is of value only in a limited number of cases, and conservatism will probably again prevail here, as also in laryngeal disease. The preventive work of Grancher deserves mention; a remarkable decrease in the death-rate of children was observed, only 7 succumbing to tuberculosis in a total of 2300 children removed from infected

parents to healthy homes till puberty. Such results prove the absence of congenital infection and of the so called tuberculous diathesis. In the matter of diagnosis of tuberculosis, unquestionably the finer methods of physical examination are being neglected for the easier method of X-ray examination, although the use of lipiodol and the X-ray in the diagnosis of bronchiectasis is an important advance.—*Tuberculosis: A Prospect, A. Adams, Tubercle, February, 1927, v, 207.*—(*G. L. L.*)

Physical Fitness in College.—Previous work on college groups from a medical standpoint has been almost entirely confined to distinction of the sick from the well, and actually recognized disease has been found almost negligible statistically. Thus, apart from some slight limitations placed on those with heart disease with reference to athletics, education has felt justified in making the work schedule on the assumption that all men are physically equal, and the physically unfit have often been overtrained. However, when college men were examined from a different standpoint, as Lee found, 95 per cent of the college population (at Harvard) were not entirely robust, healthy individuals. Emerson found, of 645 men entering Dartmouth College in the class of 1927, that 3 per cent were obese (20 per cent or more over average weight), 42 per cent in the safety weight zone (0 to 20 per cent above average), 25 per cent borderline (less than 7 per cent underweight), and 30 per cent seriously underweight (over 7 per cent). A similar grouping has been used by Director C. B. Davenport of the Carnegie Institution. He found that the "slender" and "very slender" groups were from 6 to 12 times more in danger of tuberculosis and 3 to 6 times more susceptible to respiratory and nervous disorders than the average. Furthermore, a college education does not at all improve health habits, because training the intellect has little or no effect on fundamental habits. However, we can do more than merely comment on the condition of affairs, as far as it concerns college men. Progress began when enough cases had been analyzed to roughly classify the real causes of physical unfitness. On the whole, these causes are the same that operate among younger growing persons. It is surprising to find that there is often a higher percentage of underweight in the families of the well-to-do than those socially less fortunate, the demands of their social life being more complicated, and recreation and amusement often overdone. Fully 90 per cent of cases of physical unfitness are traceable to (1) physical defects, especially nasopharyngeal, (2) lack of control, (3) overfatigue, and (4) faulty food and health habits. In the college work there has generally been cordial support by students and executives, the chief exceptions being found among men of academic bias, who are as often found among those working in the newer fields as in those closer to the classical tradition. But men of larger vision see that there is great waste of life due to effort to achieve academic, athletic and other results without provision for underlying foundations. Modern education demands and gets its pound of flesh without considering that in so doing it renders impermanent and unserviceable much of the accomplishment for which it has worked so hard. It is essential to bring the members of a school or college into condition to cope with factors essential to training, so that in later years they may pursue a course of mingled intellectual and physical activities in comfort and health, and with a sense of joy in living. At Dartmouth College physical-fitness classes were instituted, and the results were found to be well worth while. The gains in weight were especially striking as compared with those not members of the classes and with previous gains by the same men before joining the classes. Those who were noted to coöperate well made the best average gains. Men observing late hours gained nearly 100 per cent less than the entire group. Many were advised to have operations for nasopharyngeal obstructions, or at least were referred for expert examination of nose and throat. The chief difficulties affecting gain in weight were (1) grouped examinations, (2) special college functions and vacations, and (3) athletic and other extracurricular competition and activity. The obese men ran below average in high marks and above in low marks, showing twice as many low marks and less than a third as many high marks as the "safety weight" group. However, they also showed the lowest percentage of illness from nasopharyngeal causes. In the class of 1927 at the Massachusetts Institute of Technology the ten best men in college work had an average ranking of 68 per cent in physical fitness, the ten lowest 46 per cent.—*Physical Fitness in the College, W. R. P. Emerson, J. Am. M. Ass., May 15, 1926, lxxxvi, 1511.*—(*A. P.*)

Anatomico-Pathological Classification of Pulmonary Tuberculosis.—The author presents without discussion classifications of pulmonary tuberculosis according to Ranke, Fraenkel-Albrecht, Turban and Gerhardt-Turban.—*La classificazione anatomo-patologica della tubercolosi polmonare,*

M. Martinelli, Tubercolosi, October, 1926, xviii, 342.—(U. E. Z.)

Karl Turban.—Brief partial biography and appreciation of Karl Turban on the occasion of his seventieth birthday.—*Karl Turban,* (No author's name given), *München. med. Wchnschr., November 5, 1926, lxxiii, 1890.—(E. R. L.)*

Karl Ernst Ranke.—Appreciation of Karl Ernst Ranke, who died on November 8, 1926, of heart disease at the age of 56.—*Karl Ernst Ranke, G. Baer, München. med. Wchnschr., December 10, 1926, lxxiii, 2129.—(E. R. L.)*

Tuberculosis Mortality in Norway.—On the basis of the returns contained in the Norwegian public health reports, and of the results of the census enumerations, the mortality from pulmonary tuberculosis per thousand population has been calculated separately for each sex and various age groups for periods from 1880 to 1920. The results show, especially for the latest five year periods, a decrease, greatest in childhood but also well marked at advanced ages, least so in the age groups 16 to 30, especially in females. Boys show the highest mortality in the first year and a slightly higher figure than girls from 2 to 5 years. From 6 to 20 girls show a distinct preponderance, especially from 11 to 15, when the rate is twice that for boys. The highest figures for men are in the age-groups 21 to 30, for women 31 to 50. Comparison of the figures since 1900 with those before show for ages 11 to 13 a 30 per cent improvement for boys and 20 per cent for girls. From the age of 20 on the improvement also increases. In Oslo there is a lower mortality among immigrants than among the native-born, and the same is probably true for other towns. The rural rates seem unduly high, probably because of the hardier stock emigrating to towns.—*Statistical Account of the Mortality from Tuberculosis in Norway, G. H. M. Waaler, Tubercle, June, 1926, vii, 433.—(A. P.)*

Hospitalization of Tuberculous in Italy.—The mortality rate of tuberculosis has dropped from 2,128 per million inhabitants in 1887 to 1,415 per million in 1923, a decrease of only 703 deaths in 36 years. Tuberculosis causes 65 per cent of all deaths due to infectious diseases. In 75 per cent of the cases dying from this disease, localization was in the lungs. The number of tuberculous individuals existing in Italy at any time has been variously estimated to be between 250,000 and 350,000. The available hospital and sanatorium beds for the treatment of phthisis in the whole of Italy number 8,100 (approximately one bed for every 5,000 inhabitants). The average length of institutional residence per patient is about three months. The Italian National Federation of Hygiene calculated that a minimum of 48,000 beds is required. There are 17 public and 10 private sanatoria in Italy, with a total bed capacity of 2,850. The remaining beds are distributed among hospitals. Under the auspices of the government and various organizations, several new institutions, for the care of the tuberculous, are under construction.—*La spedalizzazione dei tubercolosi, G. Ronzoni, Tubercolosi, October, 1926, xviii, 355.—(U. E. Z.)*

Tuberculosis in Mental Hospitals.—The death-rate from tuberculosis in the mental hospitals of England and Wales has been reduced by about 40 per cent in the last twenty years, but it is still considerably higher than in the general population. This is attributable to several factors, not the least being that only 12 per cent of the mental-hospital population belongs to age-groups under 25, while 45 per cent of the general population belongs to this age-period. Also, the percentage of verifications of the cause of death is higher in mental hospitals, a certain percentage of deaths among the general population being certified as due to bronchitis and pneumonia, that would otherwise be tuberculosis deaths if a higher percentage of autopsies were obtainable. Certain types of patient in mental hospitals are particularly susceptible to tuberculosis, namely, chiefly the congenital defectives and cases of primary dementia. Associated with the difficulties of adequate ventilation and satisfactory heating in these hospitals is the danger from inhalation of room dust or spray from coughing in the crowded wards. One improvement, which has probably helped to reduce the death-rate in recent years, is the building of hospitals with wider window openings, greater risks being taken in the matter of custody. Congenital defectives usually succumb to tuberculosis only after long residence; those with depressed conditions and dementia praecox more frequently die within five years. One must depend almost entirely on the alertness of the medical and nursing staff for personal observation of the first signs of illness. Just as among the general population, there is a distinct seasonal incidence in the manifestations of tuberculosis in these hospitals. Research carried out in 1922 on diets in mental hospitals revealed that, as the caloric value was raised. the incidence rate of tuber-

culosis was reduced for both men and women, but the death-rate was reduced only for the men. The suggestion is made that tuberculosis patients should be brought together for care and treatment in special mental hospitals constructed on the lines of sanatoria.—*Tuberculosis in Mental Hospitals, A. E. Evans, Tubercle, February, 1927, viii, 197.*—(*G. L. L.*)

Modern Antituberculosis Work.—Improvement in methods and quickening of work or accomplishment are the spirit of to-day. Public-health administration began with warfare on prevailing communicable diseases. The Board of Health of Boston dates back to a serious outbreak of smallpox. For a long time official agencies used police powers largely in combating communicable disease, and the background of official health work is to-day of this nature. Much of this work is "shutting the stable door after the horse has been stolen." Next came the sewer gas and garbage period, when disposition of municipal wastes and inspection of plumbing came to be important functions of the health department. However, it was found that odors and garbage are not closely related to health, except when the latter favors the breeding of flies. Prevention has now come to be the most important idea in public-health work and the stand is taken that it is economical as well as humane to prevent disease, and a waste to wait to cure it when well developed. Health education of the people must underlie the entire work. The health department has difficulty in making as direct an appeal as, for instance, the police and fire departments. Much of its work must be done in the face of opposition from influential but ignorant men or from sincere but uninformed or prejudiced persons and organizations. Antituberculosis work has developed largely by unofficial agencies. Their freedom has permitted voluntary associations to undertake promising experiments, and, when facts have been established by these experiments, official health agencies have been ready to take advantage of them. The first field of effort dealt with an attempt to cure tuberculosis patients, and this is still an important part of the work. Sanatoria have developed extensively. The structure of preventoria is rapidly growing now, some features like the open-air or open-window schools or health camps appealing at once to the people. Children living under conditions that lower resistance, especially in congested cities, are the recruits for future armies of consumptives. The plan to-day is to examine children, see whether they have any indications of tuberculosis, and to investigate their surroundings. In this ten-year program the Commonwealth of Massachusetts is making examinations of children, furnishing skilled experts for this work. The follow-up work rests with the local volunteer organizations or with the community. Health education is generally left for private agencies, and such instruction as is given in schools has been rather disappointing. In Massachusetts, except in two cities, Malden and Newton, the public schools depend upon text-books and instruction by the regular school teachers. In the towns of Malden and Newton special studies have been introduced, in which each pupil is made the custodian of his health and taught to establish health habits. The parochial-school management is planning a definite line of standardized health instruction. The modern health crusade is a powerful factor. The summer health camp is a stepping stone to the preventorium and is the field in which the energies of nonofficial agencies are working. But it is rare for one community to take advantage of the experience of others. The day camp is unsatisfactory, because the children return to unfavorable conditions each night. Later comes the day and night school, with children kept continuously for two to six weeks. "Half a loaf is better than no bread," but in Massachusetts are we not ready to insist on the "whole loaf," the establishment of preventoria? Candidates should be underweights, with clinical symptoms of tuberculosis, or contact cases, usually with an adult consumptive in the home. It has been proved that such children may be made self-supporting citizens and remain so. In Massachusetts there is only one such institution, the Prendergast Preventorium of the Boston Tuberculosis Association. Malden has the legislation which will permit it to establish a preventorium and use public appropriations. A preventorium requires a considerable outlay of money. The plan must include dormitories, practically out of doors, dressing-rooms at hand which can be kept warm in winter, baths and toilets with running water and adequate drainage, heating and lighting equipment, kitchen, warm dining-room and open-air school-room. Shade trees are desirable for the rest periods. The Prendergast Preventorium is thus equipped. Candidates come from the various out-patient departments in the city. Outdoor life, proper nourishment, and supervised rest and exercise are the essential factors. Frequent examinations, weight and health charts, and correction of defects and medical treatment, when necessary, are part of the plan. There are regular school sessions, with teachers supplied by the

school department of Boston. When normal conditions have been established in the child, he goes back to his home, subject to frequent follow-up visits which are recorded. Hampshire County is also nearly at the point of establishing a preventorium having the necessary equipment in an excellent location at Westfield (near Springfield). Malden will undoubtedly soon have one. These are indications of the trend of the times in antituberculosis work of to-day.—*Modern Antituberculosis Work, J. Ritchie, Boston M. & S. J., September 16, 1926, cxcv, 579.*—(*A. P.*)

Factors in Successful Combat of Tuberculosis.—The decline in the death-rate from tuberculosis since the middle of the last century has in general been due to improved standards of living. Those who have organized to fight the disease should not, however, be too modest in acknowledging credit for a portion of this decrease. It has been more rapid than the decline of other diseases. During the past fifteen years the problem has evolved into one of preventing massive infections, especially in children, and building up the resistance to tuberculosis in the individual. The whole program devoted to this end is largely one of education fostered by a variety of methods. Among them, sanatoria have played a momentous part. Aside from benefiting great numbers of patients, they have served to remove sources of infection away from the home, and have had a profound instructive influence on both the patient and those who come in contact with him.—*Factors Leading to Success in Combating Tuberculosis, F. M. Pottenger, Ann. Clin. Med., November, 1926, v, 486.*—(*R. S. A.*)

Glasgow Conference on Tuberculosis.—Impressions are briefly given of the Glasgow Conference of the British National Association for the Prevention of Tuberculosis. Sir Arthur Stanley, Chairman of the Association, presided, and in his introductory address announced the launching of a scheme to raise a large sum of money to finance a popular educational campaign regarding the cause and prevention of tuberculosis. The importance of improving such factors as housing conditions and milk supply was stressed in an address by Sir Matthew W. Montgomery, Lord Provost. Sir Robert Philip opened the first session by presenting a paper on "The Place and Function of the Dispensary in the Tuberculosis Scheme." At the second session papers were read by Carl Browning, W. Broomhill Smith, Doctor J. A. Wilson, and Doctor Alexander Smith. Doctor Fergus S. Henderson presented a demonstration from the radiologist's standpoint. The third day was occupied by visits to various housing schemes and hospitals for the treatment of tuberculosis.—*An Impression of the Glasgow Conference of the National Association for the Prevention of Tuberculosis, J. Guy, Brit. J. Tuberc., October, 1926, xx, 161.*—(*R. S. A.*)

Tuberculosis Work in Glasgow.—This is a brief account of the Glasgow Tuberculosis Scheme. The policy of this corporation has been largely determined by the housing conditions of the population. It is noted that 84 per cent of the city's population are living in small apartments. Because of such crowding, tuberculous individuals must largely be cared for in institutions established for the purpose. There are, in all, 1,400 available beds, of which 450 are set aside for surgical or nonpulmonary tuberculosis. Increased facilities for this class are now under construction. Early pulmonary cases are provided with 200 beds, and advanced cases approximately 750 beds. There is now in Glasgow a lower death-rate per 1,000 population than prevails in the large English cities. Pulmonary tuberculosis was fatal in Glasgow in the year 1925 at a rate of 0.9 per 1,000 population, which is the lowest record in the decline that dates from 1870. In that year, 4 per 1,000 died, from the pulmonary forms of the disease. Nonpulmonary types are likewise showing a decreasing mortality.—*Tuberculosis Work in Glasgow, A. S. M. MacGregor, Brit. J. Tuberc., October, 1926, xx, 11.*—(*R. S. A.*)

Tuberculosis Campaign in Greater Berlin.—The tuberculosis campaign in greater Berlin is discussed, and it is pointed out that state insurance plays an important part. The reduction in tuberculosis mortality is, to a great extent, attributable to this agency. The number of people entering sanatoria has increased. Admission has been determined by a commission of dispensary and sanatorium physicians, which has proved very satisfactory.—*Die Organisation der Tuberkulosebekämpfung in Gross Berlin, Brunn, Beitr. z. klin. d. Tuberk., 1926, lxiii, 197.*—(*H. J C.*)

Heredity of Tuberculosis.—The question of the filterable tuberculous virus, and with it the problem of hereditary tuberculosis, is still in the domain of the laboratory. It would be premature to change existing organizations, legislative or other measures, which actually assure the social and family prophylaxis of tuberculosis.—*L'hérédité tuberculeuse, Arloing and Dufour,*

Meeting, Académie de Médecin, April 20, 1926, reported in Progrès Med., May 8, 1926, no. 19, 737.—(B. T. McM.)

Experimental Transplacental Tuberculous Infection.—It was demonstrated experimentally that, following the inoculation of pregnant female animals with filtrate obtained by filtering tuberculous pathological products or cultures of tubercle bacilli through Chamberland filters, the foetus may be infected through the placenta. When the foetuses were killed after birth many were found to have pathological foci which contained true tubercle bacilli.—*Infection expérimentale par les éléments filtrables du virus tuberculeux, A. Calmette, J. Valtis, L. Nègre and A. Boquet, Meeting, Académie des sciences de Paris, October 19, 1925, reported in Presse Méd., November 4, 1925, no. 88, 1464.—(E. H. K.)*

Consanguinity and Predisposition to Tuberculosis.—Three brothers, whose parents were cousins in the first degree, were physically and mentally underdeveloped and suffered from progressive retinitis pigmentosa, and two of them had a destructive pulmonary tuberculosis. The blood relation is believed to play a significant rôle in the etiology of these defects.—*Retinitis Pigmentosa mit Lungen-Tuberkulose bei drei Brüdern aus Verwandtensche, A. Maria Rosenstein, Wien. klin. Wchnschr., June 24, 1926, xxxix, 749.—(M. P.)*

Origin of First Foci in Pulmonary Tuberculosis.—It is generally accepted that pulmonary tuberculosis tends to be different, in both location and type, in children and adults, and the explanation generally offered is that in the adult the infection is a reinfection. But other diseases, as pneumonia, are different in the child and adult. Is it not possible that the difference may rest upon structural and functional differences in the lungs of adults and children? Drainage of the lymph is ultimately toward the hilum, although from the respiratory bronchiolus to the pleura drainage is largely peripheralward. Tuberculosis beginning in this area is always very close to the pleura. The lymphatics draining such foci in these regions become engorged and, when drainage is centralward, produce a fan-like thickening (Dunham's fan) and, when peripheralward, a thickening of the pleura, the thickening occurring both very near the diseased area and along the shortest pleural route to the hilum, that is, the interlobar pleura. Thickening of the interlobar pleura is also so commonly encountered as to be a valuable roentgenographic sign of early apical tuberculosis. Although the fan and signs of thickening of the interlobar pleura are found in conditions other than tuberculosis, notably influenza and subacute respiratory diseases, these conditions can easily be ruled out; and, if these signs are associated with abnormal parenchymatous shadows nearby, they are of very great help in pointing to early tuberculosis. A search was made for roentgenological evidence of thickening of the interlobar pleura in 399 cases of incipient tuberculosis occurring in 1,000 consecutive tuberculosis cases, and it was found in two-thirds of the cases when anterior radiographs of the chest were taken. The plate was taken by projecting the ray through the chest in a line that is parallel with the surface of the interlobar pleura, and the light must be properly adjusted with this in view if most of the thickened areas are to be detected. Both the "fan" and the pleural thickening may be thought of as *first* infections, the latter representing "drainage" from the areas of infection toward and in the pleura, and the former representing central drainage of the infectious material.—*First Infection in Pulmonary Tuberculosis. Radiographic Evidence of Pleural Dissemination in Adult Type, L. R. Sante, Radiology, June, 1926, vi, 540.—(H. S. W.)*

Etiology of Adult Pulmonary Tuberculosis.—A study was made of 300 adult cases of pulmonary tuberculosis to determine, on an exclusively clinical basis, how often adult disease may be attributed to early childhood infection. The cases were found to be divided about equally into two large groups: (1) those for which a definite or probable exposure to tuberculosis was present before the age of 16 years, and (2) those in which no such exposure could be discovered. The conclusions were that adult tuberculosis in a great number of cases is the result of early primary infection. Only a very few infants survive this primary infection, and they are always in great danger. As the child becomes a little older infection is less fatal, but the survivors make up the greater part of clinically tuberculous adolescents and adults. If the primary infection occurs outside the family, accidentally and without manifestations, it is apt to be small quantitatively, and to produce a specifically increased resistance to subsequent infections. Fortunately this is the situation in the great majority of cases, and they never develop the disease. As to the minority who do develop the disease, it is probable that their primary infection was not the ordinary one which so few escape,

but rather a heavy one or one acquired at an unfavorable moment. As for the rôle of contagion in the adult, while it is not negligible and while every precaution must be taken, nevertheless it is exceptional, and efforts at prophylaxis should bear essentially on the protection of children and within the family circle.—*Étude statistique sur l'étiologie de la tuberculose pulmonaire chez l'adult. Rareté des contagions nouvelles. Importance de la contagion familiale ancienne, L. Bernard and L. Denoyelle, Ann. d. Méd., 1926, xix, 561.*—(*W. B. S.*)

Reactivation in Tuberculosis.—In order to investigate the influence of various diseases on the reactivation of tuberculous foci, 176 autopsies were studied in which active tuberculous lesions were found, not, however, directly connected with the cause of death. The frequency of active tuberculous lesions was as follows: in arteriosclerosis, 52 per cent; mesaortitis, 31 per cent; emphysema, 26 per cent; pneumonia and pleuritis, 25 per cent; malignant tumor, 23 per cent. A mixed group of chronic diseases, such as cholelithiasis, nephritis, tabes, etc., had a frequency of 31 per cent. Fifty per cent of all nephritis cases showed tuberculous lesions. The author is inclined to attribute the active tuberculous foci observed to endogenous reinfections, and he suggests that the chronicity of an ailment is the chief determining factor in its reactivating influence upon old and latent tuberculous foci.—*Über Ursachen und Häufigkeit der Reaktivierung inaktiver tuberkulöser Herde, A. Arnstein, Klin. Wchnschr., February 12, 1927, vi, 302.*—(*M. P.*)

Pharyngeal Lymphatic Ring Portal of Entry.—The structural differences between the lymphoid tissue in the pharyngeal ring and the lymph nodes denote a difference in function. While the latter, with their afferent vessels and sinuses, filter the inflowing lymph, the lymphoid pharyngeal tissue, which is devoid of these structures, is a filter-station for material entering the body from the mucous surface. Its distribution along the epithelial surface enhances this function. Experimentally controlled observations show that the tonsils and some of the cervical lymph nodes swell after oral or nasal infection with minimal doses of tubercle bacilli, that during this time the animals are allergic to tuberculin, and that after some time both swelling and hypersensitiveness subside. At no time are specific histological changes demonstrable. Accordingly, a small number of bacilli can be disposed of without causing inflammatory reactions. If this infection is too heavy, the bacilli enter upon the second line of defense; that is, the superior cervical, retropharyngeal and submaxillary lymph nodes. Here the fight may end successfully for the host, as evidenced by the finding of pathogenic microörganisms in these nodes without histological alterations. If this second line of defense is overwhelmed by an infection, bacilli may reach the general circulation. As long as an infectious stimulus remains within physiological limits, a nonspecific hyperplasia will be the only response; stronger stimuli cause definite injuries to the tissue and inflammatory alterations. This mechanism is not only dependent upon the strength of the infection, but on the resistance of the host as well. A number of diseases enter particularly frequently through the pharyngeal lymphatic tissue: osteomyelitis; endocarditis, which is frequently, in spite of the generally accepted view, a precursor of acute rheumatic arthritis; nephritis; infantile paralysis; epidemic meningitis, which is, more accurately speaking, epidemic meningococcic angina, developing in a number of cases into meningitis; appendicitis; typhoid fever. A retrograde lymphogenous spread is possible only when the drainage is under pressure, and then it will take place for a short distance only. Spread by continuity may ensue when the lymph-node lesions give rise to cellulitis or thrombophlebitis.—*Ueber den lymphatischen Rachenring und seine Rolle als Eintrittspforte von Infektionen, H. Beitzke, Wien. klin. Wchnschr., December 16, 1926, xxxix, 1473.*—(*M. P.*)

Industrial Fatigue and Tuberculosis.—Brownlee's analysis of phthisis mortality records displays the disease as taking its victims at different periods of life: (1) in early life, highest at 6 months of age and declining to 10 years of age; (2) in early adult life, highest at about 20 years of age; and (3) in late middle life, highest at about 50 years of age. Clinically the disease conforms to three different types at these periods. The first is the acute generalized febrile disease; the second, while still febrile, is more localized to the lungs; the third is the chronic, entirely pulmonary disease. Fatigue is the sum of the results of activity which show themselves in a diminished capacity for work. In healthy fatigue, the condition of diminished activity is entirely recovered from before the next spell of activity. In overfatigue this condition of diminished activity is not recovered from. If fatigue is persisted in, so as to cause continuous overfatigue, then, sooner or later, bodily elasticity is overstrained and true recovery is impossible. This condition of overstrain is pathological and is what is

usually understood when the relation of fatigue to disease is discussed. Active metabolism, associated with healthy fatigue, does not lower resistance to infection. Spaeth states that natural resistance in animals is a function of anabolic rate. This has long been recognized in the treatment of tuberculosis in man. Diabetics, whose anabolic rate is reduced, are very susceptible to infection. Fatigue, therefore, exerts no influence in lowering resistance. There remains yet the other stage of fatigue, overstrain. In babyhood evidence of fatigue and overstrain can hardly be expected. The ruling influence during this period is a resisting power that is slight and not inherited. War-time experience has taught that insufficiency in diet is an important influence concerned with the tuberculosis mortality in early adult life, from 15 to 30 years of age. Since the infecting agent, the tubercle bacillus, remains the same, the difference in cause must lie in the host, the human body. In early adult life overstrain, due to excessive activity, may hardly be expected to have advanced so far as to be a pathological condition. If war-time evidence is accepted, malnutrition exerts no influence after the stability of the body is fixed. In the period from 40 to 70 years of age, pathological conditions resulting from overstrain become manifest. If the theory that pathological damage resulting from overstrain predisposes to tuberculosis is correct, then there is statistical proof relating to this period of life. Generally speaking, the phthisis mortality in late life is always higher in the male. The sex, which on account of its occupational life, is most exposed to strain, always shows a higher mortality in the late adult period. The males in industrial communities, because of their more strenuous life, exhibit a far greater mortality from 35 years onward than do the males in rural counties. The same holds for the two groups of females, though not as pronouncedly. Certain occupations, tending to aggregate the workers, help to spread the infection. Toxic conditions also have an important influence. Alcoholism predisposes to all sorts of diseases as well as to tuberculosis. An alcoholic is, age for age, older than the temperate man and he commences to die from all causes of death earlier in life. The conditions in silicosis vary. In this condition the lungs are profoundly damaged, and those unduly exposed to silica experience a high mortality not only from tuberculosis but also from pneumonia and bronchitis. The age of maximum tuberculosis incidence in this group coincides with the middle-age type of phthisis. *Conclusions: 1:* Phthisis mortality in late middle life is an expression of lowered resistance to tuberculous infection owing to the fact that the lungs have become damaged pathologically. *2:* Such pathological damage is an end-result of overstrain resulting from chronic fatigue or, at least, of industrial life, which appears in the past to have engendered a condition in middle life favorable to chronic phthisis. *3:* If the influence of malnutrition in early adult life and of overstrain in middle life have any meaning, they suggest the need for (1) stimulating anabolism in patients up to 30 years of age, and (2) for prolonged rest in the case of patients in middle life; that is to say, the age of the patient should be as important a factor in determining treatment as is the clinical condition.—*Industrial Fatigue in Connection with Tuberculosis, E. L. Collis, Tubercle, November, 1926, viii, 49.*—(*U.E.Z.*)

Acute Progression of Pulmonary Tuberculosis Following Trauma.—A case of severe but chronic pulmonary tuberculosis, with cavity, changed by trauma into a rapidly active form, terminating in death within fifteen days, is described. At autopsy there was found a tuberculous pneumonia based upon a traumatic pulmonary edema.—*Akute Verschlimmerung einer Lungentuberkulose nach einem Trauma, J. Ritter and W. Gerlach, Beitr. z. Klin. d. Tuberk., 1926, lxiii, 601.*—(*H. J. C.*)

Tuberculous Milk Infection.—Bovine tuberculosis in human beings varies greatly in incidence in the different countries from which reports have been made. From an examination of the records of 100 children in the United States with tuberculosis it was found that 39 of them had had severe tuberculosis of the cervical lymph nodes, 22 had had tuberculosis of the tracheobronchial nodes, 19 had had disease in both these sets of nodes, 10 had had tuberculosis of the mesenteric lymph nodes and 10 had died of tuberculous meningitis. Seventy-nine of the children were under six years, and in 13 there was a history of contact with human tuberculosis. Of the 100 cases 86 had been fed raw cow's milk in infancy. No bacteriological studies were done. Pure milk for children should be regarded as an absolute necessity, because children with bovine infection, even though they eventually survive, are usually in a weakened, undernourished state, and are subject to various diseases, with loss of time at school. Many become public charges, and thus the question assumes economic importance. Bovine tuberculosis can be eliminated either (1) by the use everywhere of certified or pasteurized milk and (2) by the elimination

of all reacting cattle.—*Pure Milk Absolute Necessity for Children, H. E. Utter, J. Am. Vet. Med. Assn., June, 1926, lxix (n.s. xxii), 282.*—(*H. S. W.*)

Case of Congenital Tuberculosis.—A mother with open pulmonary and laryngeal tuberculosis bore an apparently healthy child, but the mother died 18 days after delivery. The child was entirely removed from the mother after delivery. On the 26th day it exhibited a positive tuberculin reaction, and on the 106th day roentgenological pulmonary foci. Except for a slight cough and subfebrile temperature for two days the child had no symptoms of the disease, and was alive 128 days after birth and weighed 1600 gm., and had increased in length 10.5 cm.—*Über kongenitale Tuberkulose, R. Kochmann, Ztschr. f. Tuberk., 1926, xliv, 140.*—(*H. J. C.*)

Fatal Tuberculous Infection Immediately after Birth.—An infant died at the age of three months and ten days with tuberculous bronchopneumonia and generalized tuberculosis. It was born April 10, and completely isolated from its mother April 11. The mother suffered from tuberculosis. The baby was not exposed to other tuberculous subjects. Infection of the baby must have taken place during the first 24 hours of life, before birth, or during birth. This case would seem to be a refutation of the opinion of those who believe that the severe, fatal forms of tuberculosis in infancy are the result of massive and repeated infections.—*Remarques sur un cas de tuberculose tres precoce, L. Louet, Nourrisson, January, 1927, xv, 25.*—(*P. J. W.*)

Fate of Exposed and Infected Infants.—Of 129 exposed infants and small children, between the ages 0 to 7 years, 59.7 per cent became infected, and the infection took place in the first year in 87 per cent of all the cases. Sixteen (12.4 per cent) of the 129 died of tuberculosis and of these 7.75 per cent died during the nursing period. Of 67 infected during the nursing period, 23.9 per cent died of tuberculosis. Of 10 infected in the second year or thereafter none died. The predominant cause of death was tuberculous meningitis. While 3 cases of pulmonary tuberculosis occurred during the first three years of life with fatal termination, generalized tuberculosis predominated in the first year. The mortality among infants paralleled the severity of the infection, since most of the fatal cases came from sources of heavy infection. None of the mildly infected children died. The period of retrogression of a manifest primary tuberculosis averaged two to three years, and of a secondary bronchial lymph-node or pulmonary tuberculosis two to four years. The development of a tertiary tuberculosis from the earlier forms was not noted in infants and small children.—*Das Schicksal tuberkuloseinfizierter und -gefährdeter Säuglinge, Harms and Seitz, Beitr. z. Klin. d. Tuberk., 1926, lxiii, 461.*—(*H. J. C.*)

Artificial Pneumothorax in Infants.—A report is given of 58 new cases of therapeutic pneumothorax carried out on children during 1925 and of 14 old cases whose treatment was continued. Among these patients, there were 5 nursing babies, in 4 of whom very satisfactory results were obtained. One, under treatment for two years, is considered cured, and the spina ventosa present disappeared equally. In the 40 cases of unilateral tuberculosis, in which the collapse was complete, 18 showed very good results, all the pathological symptoms disappeared, and there was considerable increase in weight; 11 showed good results with a disappearance of bacilli, 11 mediocre results, and only 2 bad results, with spread of the disease to the other lung and death. Bilateral pneumothorax was practised in 3 cases. In one the result was very good. There was one mediocre result and in the third the disease continued to progress. Effusion developed in only 10 cases. In the other cases multiple adhesions prevented complete collapse, so that symptoms and bacillary sputum persisted.—*Résultats de 58 nouveaux cas de pneumothorax chez l'enfant, P. Armand-Delille, Vanbockstaele and Panier, Meeting, Société Médicale des Hôpitaux, April 23, 1926, reported in Progrès Méd., May 8, 1926, no. 19, 737.*—(*B. T. McM.*)

Classification of Pulmonary Tuberculosis in Children.—This classification is dependent upon the "tripod essential to the diagnosis of pulmonary tuberculosis in childhood:" (1) a definite history of contact, (2) a positive tuberculin test, and (3) the presence of enlarged tracheobronchial lymph nodes. Between 64 and 81 per cent of all exposed children become infected. It is imperative that all contacts have a tuberculin test (intracutaneous) to determine the presence or absence of a focus, and that all those giving a positive test have an X-ray of the chest to determine the extent of the focus. Those giving some evidence of the disease are subdivided into three groups: (1) those with positive tuberculin tests, but with no other evidence of disease, (2) those with positive tuberculin tests, yet with slight enlargement of the tracheobronchial lymph nodes, and (3) those

with positive tuberculin tests and with massive enlargement of the tracheobronchial lymph nodes. In 95 per cent of the children who have a tuberculous lesion the primary focus is in the lung and the secondary infection in the tracheobronchial lymph nodes. A markedly positive D'Espine sign does not necessarily indicate the amount of involvement, and a negative sign does not always mean the absence of tuberculous changes. The author's final classification is as follows: *Group 1:* Children who give a definite history of contact, but with a negative tuberculin test. *Group 2:* Children with a definite history of contact and a positive tuberculin test, but with no definite evidence of disease and no appreciable enlargement of the tracheobronchial lymph nodes. *Group 3:* Incipient tuberculosis of childhood. Those giving a definite history of contact, a positive tuberculin test, and slight enlargement of the tracheobronchial lymph nodes, as ascertained by X-ray. *Group 4:* Massive enlargement of the tracheobronchial lymph nodes, fibrosis and calcification, and a positive tuberculin test. *Group 5:* Adult type. Parenchymal infiltration and breaking down of lung tissue, with a tendency to cavity-formation and with definite physical signs, superimposed upon the juvenile type.—*Classification of Pulmonary Tuberculosis in Children, H. A. Reisman, Arch. Pediat., March, 1927, xliv, 165.—(P. J. W.)*

Incidence of Tuberculosis among School Children.—A tuberculosis survey among the children of three industrial districts revealed isolated calcified foci in 20.8 per cent, 45.7 per cent being Moro positive, and of these 25.5 per cent showed primary foci. Of the calcified primary-foci cases 43.8 per cent reacted negatively to the Moro test. Females yielded a higher percentage of infection than males. The majority (60.4 per cent) of the isolated calcified foci were on the right side and in the lower lobe. In 43.2 per cent of the children there was no infection. The smallest percentages of healthy individuals among the infected children were found at ages 8–9 and 11–13 years. Of the girls 6.6 per cent had an active scrofulosis, 1 per cent having active pulmonary or bronchial lymph-node tuberculosis. Of the total number examined, 62.6 per cent of the noninfected children came from tuberculosis-free families, while 52.8 to 65.6 per cent of the infected children had some family contact. Over a period of 4 years, 0.82 per cent of the school children presented tuberculous bronchial lymph nodes or pulmonary disease, and of these 1.35 per cent were from industrial centres and 0.31 per cent from rural areas. Tuberculous bone and joint disease occurred in 0.28 per cent of all the school children, 0.38 per cent from industrial regions and 0.19 per cent from rural communities.—*Über die Häufigkeit der Tuberkulose im Schulkindersalter, F. Ickert, Ztschr. f. Tuberk., 1926, xliv, 433.—(H. J. C.)*

Primary Infection in Tuberculosis.—This is an analysis of 6,329 fluoroscopic examinations made on 40,818 patients in the University of Vienna Kinderklinik, from 1921 to 1924 inclusive. All the children were brought to the clinic because of fever or anorexia, pallor or loss of weight, or cough of the productive type. There were 584 single primary infections, or 9.27 per cent, and 27 multiple infections, or 0.42 per cent. The total number of primary infections was 611, or 9.65 per cent. For 1921, 1923 and 1924, the order of single primary-focus incidence was: (1) right lower lobe, (2) right upper lobe, (3) left lower lobe, (4) left upper lobe, and (5) right middle lobe. For 1922 the right middle-lobe lesions outnumbered those of the left upper lobe. Enlargement of the hilum lymph nodes on the same side as the infection was found in 423, or 72.52 per cent, of the subjects with single primary infections. In 107, or 25.2 per cent of the cases, enlargement of the hilum nodes on the opposite side was visible. Extension from right to left and from left to right was found to occur about equally often. The youngest patients revealing a primary focus in the lungs on fluoroscopy were in the second year of life. Some of the nurslings may have shown a primary focus as a pneumonic shadow or cavitation which was not recorded because of confusion of specific and nonspecific processes. The incidence of infection increases, though not uniformly, from zero in the first year of life, to 15.75 per cent in the fourteenth year. In 27 children, or 4.2 per cent, more than one shadow of infection was noted. Pleural involvement was noted in only 30 cases, or 0.05 per cent. Sixteen, or 53.3 per cent, of these were interlobar, and 14, or 46.7 per cent, adhesions. The former were seen as congestions. Each child was given the tuberculin test. If the Pirquet proved negative, the intracutaneous test was made. The total number of children with definitely positive tuberculin reactions was 4,494, or 71.02 per cent; and with definitely negative Pirquet and Mantoux tests (using finally 1 mgm. of tuberculin), 253, or 3.8 per cent. There were 665 children, or 10.6 per cent, who gave negative Pirquet reactions, but had no further tests made. Of the 4,494

subjects giving a definitely positive tuberculin reaction, only 584, or 12.9 per cent, showed a definite primary infection or focus on fluoroscopy. Practically speaking, all primary foci are pulmonary. The discrepancy must be due to the fact that though the primary infection is present, in certain cases it is not evident roentgenologically. A definitely dense shadow (calcium or caseous density), sharply circumscribed in the lung field, irregular or regular in contour, and usually the size of a pea, in a child with a positive tuberculin reaction, may be considered a primary focus. Given these findings and a pathological hilum or disease of the hilum lymph nodes, a roentgenological diagnosis of tuberculous disease of the lymph nodes may be made. The author emphasizes very strongly the importance of making fluoroscopies in more than one diameter for the study of the tracheal bifurcation and retrocardiac space, as well as for the vessels, spine, esophagus, etc., and of using the lordotic position in infants.

Comparative observations on children with positive tuberculin reactions

	AUTHOR'S PERCENTAGES	HAMBURGER AND MONTI'S PERCENTAGES
First year	14.7	1
Second year	42.7	9
Third to fourth year	50.6	27
Fifth to sixth year	73.9	51
Seventh to tenth year	82.2	71
Eleventh to fourteenth year	84.8	91

The figures of Hamburger and Monti are for the general population of children (Vienna) before the war. The author's are postwar figures, and represent the results of tests in a clinic for sick children. This probably accounts for his average increased percentage.—*Primary Infection in Tuberculosis, E. G. Stoloff, Am. J. Dis. Child., March, 1927, xxxiii, 363.*—*(P. J. W.)*

Primary Focus in Lungs of Children.—Ghon's observation of a primary focus in the lungs of children who have tracheobronchial tuberculosis has been repeatedly confirmed. The infection spreads from the pulmonary focus to the hilum, and it is nearly always the latter rather than the former that is detectable clinically or that produces illness. The focus begins as a small tubercle in the peribronchial lymphoid tissue and may spread to surrounding tissue and may become conglomerate. It may vary in size from that of a pin's head to that of a cherry; the larger are usually caseous and the smaller ones fibrous or calcareous. The focus is supposed to be the primary point of infection on the following grounds: (1) if a pulmonary focus exists there is practically always tuberculosis in the tracheobronchial nodes; (2) conversely, when there is mediastinal tuberculosis, a pulmonary focus is also present; (3) the lymph nodes involved in such a process correspond to those which drain the area in which the focus is situated; and (4) the tuberculosis in the tracheobronchial lymph nodes always appears fresher (or at least as fresh) and never older than that of the focus. The likelihood that the focus in the lung is a primary infection, and not one secondary to some focus elsewhere in the body, is supported by the following facts: (1) in most instances no extrapulmonary focus can be demonstrated; (2) in most cases having an extrapulmonary focus no pulmonary lesion can be found; and (3) if the pulmonary focus were secondary to some lesion elsewhere, for instance, in the abdomen, the type of bacillus most commonly found in the lung should be the bovine bacillus, but this is not the case. Other considerations may be brought to bear in coming to a conclusion regarding the correctness of Ghon's position, and there may be exceptions to some of the arguments advanced. But there seems to be no doubt that the theory holds good in far the greater number of cases.—*The Primary Tuberculous Lung Focus in Childhood, R. G. Canti, J. State Med., February, 1927, xxxv, 104.*—*(H. S. W.)*

Hilum Tuberculosis.—We have begun to realize that the seeds of tuberculosis are sown in childhood. As tuberculosis in childhood is primarily a disease of the lymphatic system, it is natural that greater significance should be attached to the importance of the bronchial lymph nodes in the spread of tuberculosis. The term "hilum tuberculosis" was adopted in 1925 by the American Sanatorium Association. Chadwick has discussed the reasons for its adoption, as a form of tuberculosis primarily an adenitis, and really the commonest form of adenitis, the order of frequency being tracheobronchial, cervical, mediastinal and mesenteric. The character of the infection depends not so much upon the age as upon the degree of individual immunity. When this is low, there is a rapid extension, caseation and metastases; when high, localization,

fibrosis and calcification. Latent nonclinical infection is frequent. *Diagnosis:* This should be made guardedly. Physical signs are usually conspicuous by their absence and roentgenograms frequently confusing. In relative order of diagnostic importance come: (1) history, (2) constitutional signs and symptoms, (3) physical examination, (4) X-ray, and (5) tuberculin reaction. A history of exposure is important if definite and clear-cut. A history of frequent coughs, colds and sputum is much less significant and more apt to go with some nontuberculous chronic lung infection. A history of other enlarged lymph nodes is important. Constitutional signs and symptoms are important, sometimes the most so of all diagnostic features. They are as follows: (1) Undue fatigue. This is rarely mentioned by the child but ascertained from observation. (2) Irritability and changes of temperament. (3) Underweight or failure to gain weight. In this connection, good home conditions with *real* underweight or failure to gain is significant; bad home conditions with underweight mean nothing. (4) Fever, when present, is usually intermittent, occurring in the afternoon or after exercise. A normal temperature does not exclude the possibility of hilum tuberculosis. Physical examination is of limited importance. Inspection is more valuable than detailed percussion and auscultation. Palpation may reveal evidence of cervical, axillary, inguinal or mediastinal lymph-node enlargement. Few attach as much importance to interscapular dulness as Chadwick. Auscultation occasionally reveals a prolonged drawn-out expiratory note on one side, suggestive of pressure of an underlying lymph node on a bronchus. The X-ray is of greatest value in excluding parenchymatous lung conditions. It may reveal enlarged bronchial lymph nodes, but does not indicate whether these are tuberculous, and such a distinction should not be attempted in the absence of calcification and of clinical knowledge of the case. We are at present relying too much on the opinions of radiologists in making diagnoses. The tuberculin test, when positive, merely indicates a focus of tuberculous infection, but a persistently negative reaction is good evidence against tuberculosis. In many instances a diagnosis of hilum tuberculosis requires repeated observation. Without important constitutional signs a definite diagnosis should not be made. It is, of course, important to exclude sinus or antrum infections, infected teeth or tonsils, and other respiratory-tract infections, before concluding the cause of the symptoms to be hilum tuberculosis. *Treatment:* The first measure, when the child is definitely exposed to infection, is to remove it from the source of further infection. Undernourishment and poor home conditions must be remedied. The object is to keep the child's resistance up to normal in order that the infection in the lymph nodes may be kept latent during the transition from juvenile to adult age.—*Hilum Tuberculosis, R. Clifford, Boston M. & S. J., September 16, 1925, cxcv, 571.—(A. P.)*

Tuberculous Tracheobronchial Adenopathy in Children Simulating Asthma.—Of several hundred children under observation in the asthma clinic during the last four years, three were encountered in whom this condition occurred. These cases are likely to be, and no doubt are, frequently overlooked. The condition is a definite clinical entity and of grave significance. The three cases are reported with roentgenograms. The condition is largely confined to infants and young children, and the child generally begins to wheeze during the first year of life. It presents a pinched appearance, and respiration is greatly embarrassed. The dyspnea is characteristically expiratory. Numerous rhonchi and musical râles are to be heard. The spleen and liver are often enlarged. Epinephrin injections do not afford relief. The Pirquet test is always positive and readily confirmed by the intracutaneous test. Roentgenoscopy reveals wide, irregular hilum shadows, interpreted as masses of enlarged tracheobronchial lymph nodes, enormous in size for a small child. Infiltration may be found at the base. Apparently Variot, Bruder and Guinon in 1904 were first to observe the association of this particular type of dyspnea with enlarged bronchial nodes. Of Schick's 36 cases, reported in 1910, 13 were confirmed at necropsy. American literature contains few references to the condition. Differential diagnosis must distinguish true bronchial asthma, usually of later onset and at any rate not showing the typical early positive tuberculin skin reaction, "thymic" asthma, spasmophilia (or bronchotetany), laryngeal diphtheria, congenital stridor, and foreign-body obstruction. The mechanical-obstruction theory of the symptoms, advanced by Schick, is more satisfactory than the various neurogenic and toxic theories. The prognosis is usually poor, although healing may occur under suitable hygienic environment, perhaps combined with actinotherapy and roentgen-ray therapy.—*Enlarged Tuberculous Tracheobronchial Glands Simulating*

Asthma, M. M. Peshkin and A. H. Fineman, J. Am. M. Ass., May 8, 1926, lxxxvi, 1429.—(A. P.)

Diagnosis of Pulmonary Tuberculosis in Children by X-Ray.—Tuberculosis of the lungs in children, much more commonly than not, presents itself in the roentgenograph as an enlargement of the tracheobronchial lymph nodes, the primary focus in the lung itself being so small or inconspicuous as to be overlooked. But lymphadenopathy from other infections may produce signs that are indistinguishable from those produced by tuberculosis, and clinical study and history must be taken into account before the diagnosis can be made. Repeated plates are helpful, because enlarged lymph nodes may undergo resolution or caseation, fibrosis or calcification. Subsequent plates may therefore show a lessening in the size or a disappearance of the nodal shadows; or they may show signs of extension of the process into the neighboring pulmonary tissue or a widespread miliary tuberculosis. They may likewise show signs of fibrous healing or deposition of calcium. There should be a closer association between the physician and roentgenologist in the interpretation of plates.—*X-Ray Diagnosis of Pulmonary Tuberculosis in Children, J. F. MacRae, Radiology, May, 1926, vi, 417.—(H. S. W.)*

Tuberculin Reaction in Children.—The tuberculin skin reaction has a considerable diagnostic value in children under ten years of age. Beyond this age its frequency approaches that of the adult, and the interpretation of the results obeys the same rules. The following results are based on a study of 800 hospital patients under 2 years of age suffering from diverse diseases: Before 3 months the skin reaction was positive in 0.65 per cent, from 3 to 12 months, in 11 per cent, and from 12 to 24 months in 21 per cent. With reservations for the ante-allergic phase, the skin reaction is positive in the course of all tuberculosis, active or not, independent of the clinical-anatomical form of the disease, and independent of the time of observation. The reaction remains positive to the verge of death. Of all intercurrent maladies, only measles renders the skin reaction temporarily negative. It alone is anergizing. Apart from these two reservations, all negative reactions in children under 10 years of age rule out tuberculosis. Prognostic significance cannot be drawn from the variations of the reaction (intensity and precocity) in the young child. The issue has been brief in these children observed in a children's hospital. The mortality was around 70 per cent before 1 year and 47 per cent from 1 to 2 years. All those discharged living and recovered had been submitted to bacillary contact.—*Valeur diagnostique de la cutiréaction à la tuberculine chez le jeune enfant, Lesné and Coffin, Meeting, Société Médicale des Hôpitaux, May 14, 1926, reported in Progrès Méd., May 29, 1926, no. 22, 852.—(B. T. McM.)*

Tuberculin Reactions in Contact and Noncontact Children.—This study was made to determine the incidence of tuberculous infection in contact and noncontact families in the semirural communities near Denver. Eighty-four children were studied, the ages ranging from one to fifteen years. Since many of the poorer "contact" families were included, the figures do not represent a true index of tuberculous infection in the communities in which they live. Of 48 children having a definite history of family exposure, 31, or 64.5 per cent, showed a positive tuberculin reaction. Of 36 children having no history of family contact, only 7, or 19.4 per cent, had positive reactions. There was no definite relation between either the incidence or the degree of malnutrition and tuberculous infection in this group.—*Tuberculin Reactions in Contact and Non-Contact Children, B. Green and R. P. Forbes, Arch. Pediat., January, 1927, xliv, 58.—(P. J. W.)*

Ultraviolet Light in Pediatrics.—The value of sunlight as a healing agent has been realized by mankind from the very earliest time of which we have any record. Herodotus, 431 B. C., mentions the sun-bath and recommends it for restoring muscular tone. Rollier of Leysin and Bernhard of Samaden deserve the credit of reëstablishing heliotherapy as a therapeutic measure of value. In New England it is impracticable to expose an infant to the direct rays of the sun, and it is oftentimes inadvisable to expose older children, except during the warm summer months, on account of the cold and consequent loss of body heat. The ultraviolet rays in the sun's spectrum vary in intensity during the different seasons of the year, being highest during the summer months and lowest during the winter months. In New England during the winter months it is questionable whether or not there are sufficient ultraviolet rays in the sun's spectrum to be of much therapeutic value. At present, during the winter and on cloudy days in summer, it is necessary in treating infants to use a substitute for sunlight.

The mercury-vapor quartz lamp is the best means of artificially producing rays similar to the short therapeutic rays in the sun's spectrum. The scheme of exposure to this source of light, as well as to direct sunlight, is given in detail. In both forms a gradual exposure to the rays is employed; first the legs and thighs, then the abdomen from the ribs to the hips, and last the chest. The head is always protected from the direct rays of light. Many patients with dark skins can stand twice as much natural sunlight as artificial sunlight. The combination of ultraviolet light with codliver oil for rickets, and with calcium chloride for spasmophilia, has been found to give excellent results. Patients treated for tuberculosis of the mediastinal and mesenteric lymph nodes have responded well to ultraviolet therapy. Results in tuberculous peritonitis have been variable. It is believed that it should be used unless there is marked febrile reaction. It is much more difficult in treating tuberculosis and many other diseases with ultraviolet rays, to draw definite conclusion as to the benefits obtained from this form of therapy, because in rickets and tetany the blood chemistry and roentgen-ray give confirmatory evidence of recovery. In tuberculosis one has to depend almost entirely on clinical findings to note the progress of the case, and it is often difficult to tell how much the disease has been influenced by the rest, fresh air, proper nourishment and general hygiene given as a routine treatment in addition to the ultraviolet rays. Good results with ultraviolet therapy have frequently been obtained in psoriasis, furunculosis, eczema and bronchial asthma. Ultraviolet-light therapy has a specific action in the treatment of rickets and spasmophilia, and is a valuable therapeutic agent in the tuberculous conditions mentioned.—*Clinical Application of Ultraviolet Light, E. T. Wyman, Boston M. & S. J., August 26, 1926, cxcv, 396.*—(*J. S. W.*)

Calcium Content of Blood of Tuberculous Children.—Five cases of "primary," four of "secondary," and three of "tertiary" tuberculosis were studied, the ages of the children ranging from four to twelve years. All were given codliver oil. Active calcium treatment consisted of 5 gm. of anhydrous calcium chloride, 1 gm. of iron, and 4 cc. of codliver oil after each meal. In addition, parathyroid was given, "1 tablet *t.i.d.*" Blood-calcium determinations were made before, after 8 weeks and after 5 months of treatment. There is a definite calcium deficiency in the blood of tuberculosis patients. The far-advanced cases showed the lowest blood-calcium. Calcium is of value in the healing of tuberculosis, but has no decided therapeutic value in the advanced cases. Five months' treatment increased the blood-calcium remarkably in the "primary" and "secondary" cases.—*Calcium Content in the Blood of Tuberculous Children, H. R. Litchfield, Arch. Pediat., February, 1927, xliv, 99.*—(*P. J. W.*)

Report of Veterinary Committee on Tuberculosis.—Now that the work of eradication of bovine tuberculosis is so well under way, the Committee on Tuberculosis has turned its attention to the growing interest in avian tuberculosis and to specific protection against tuberculosis among domestic animals, since it has been shown that avian tuberculosis is transmissible to swine and cattle.—*Report of Committee on Tuberculosis of the American Veterinary Medical Association, V. A. Moore, J. Am. Vet. Med. Assn., October, 1926, lxx (n.s. xxiii), 101.*—(*H. S. W.*)

Tuberculosis of Live Stock.—The incidence of tuberculosis of cattle is higher in the eastern portion of the United States, but in hogs and poultry it is much higher through the middle West, where it is a serious economic problem. Climate appears to have little influence on the incidence of the disease, but close, shut-in quarters contribute to it. Range cattle, mostly steers, show a much lower incidence than dairy cattle, and it is likely that much tuberculosis was brought in with imported breeding stock. The preventive work already under way must be continued. It consists of "county area-testing" and elimination of all reactors. The work, supported by both Federal and State appropriations, is very costly, but results have more than justified the expenditures. When systematic area-testing was established in 1917, 20,000 cattle were tested during the year, but in 1925 more than 7,000,000 were tested. About one-third of the breeding cattle in the United States have been tested, showing a very gratifying decrease in occurrence of the disease. Hogs have been found to be infected with avian tubercle bacilli, and, until the disease is eradicated in domestic fowls, there will likely not be the satisfactory improvement in the situation that now obtains among cattle.—*Tuberculosis as a Live Stock Problem in the Middle West, H. R. Smith, J. Am. Vet. Med. Assn., June, 1926, lxix (n.s. xxii), 290.*—(*H. S. W.*)

Abortion among Tuberculous Cattle.—Tuberculous metritis is responsible for a good deal of abortion in cattle and may

occur as "(1) acute tuberculosis of the uterus, (2) the interstitial and (3) the ulcerative form." The latter is most commonly encountered, and all are simply different stages of the same disease. Tubercle bacilli are scarce, and very hard to find. Whether the infection is primary is not known. It probably occurs in 1.5 per cent of cases of abortion and it may coexist in cases of abortion produced by *B. abortis*. The condition can rarely be diagnosed clinically, and study of the fetus is usually necessary for an appreciation of the true condition. Evidences of the disease are usually present in the lymph nodes tributary to the liver and in the tracheobronchial lymph nodes. The appearance of the placenta gives no clue to the condition. Any birth occurring before two hundred and ten days—the shortest period of normal gestation—constitutes an abortion. They are more commonly late than "early." Of 74 calves born during abortion 49 were proved to be tuberculous at autopsy. Scrapings from the placenta of 136 cases of tuberculous abortion were inoculated into animals, 7 of which died a few days later; 124 of them showed mammalian and four avian bacilli. From the placenta of one animal tubercle bacilli were found in smears, and some of the tissue was inoculated into guinea pigs and rabbits, and from the rabbits (which developed tuberculosis) into hens, which in turn succumbed to the disease. The cow reacted to avian but not to bovine tuberculin (subcutaneous test). Bacilli were grown on potato cultures from the rabbits. At autopsy the cow was normal, but for four small nodules, the size of a pea, in one horn of the uterus, which were found to contain thick yellow pus. The calf also reacted to avian tuberculin but not to bovine tuberculin, and at autopsy proved to be normal in every respect. It would appear that the subcutaneous is more reliable than the intracutaneous test.—*Tuberculous Abortion among Cattle, N. Plum, J. Am. Vet. Med. Assn., lxix (n.s. xxii), 441.—(H. S. W.)*

Eradication of Tuberculosis among Domestic Animals.—Great progress is being made in the radication of tuberculosis of live stock in the United States, over 8,500,000 cattle having been tested during the last fiscal year. Since 1917 more than 1,000,000 reacting cattle have been killed, yet the industry is in a highly flourishing state. Fifteen million cattle are now under state and federal supervision for the control of the disease, and of these nearly 2,000,000 are in fully accredited herds. Nearly 800,000 cattle were accredited last year, and 768 veterinarians were employed who did nothing else but eradication work. The county, rather than the individual herd as the unit, is coming to be the basis of the eradication program. There has been an increasing number of cattle in interstate traffic, and over 400,000 of such cattle were tested last year prior to shipment. Seven and one-third million intracutaneous tests, as compared with 1,200,000 ophthalmic and 3,216 subcutaneous tests, were made last year. The eradication of tuberculosis in poultry is becoming increasingly important because of the susceptibility of swine to the avian bacillus. During the last year more than 14,000,000 fowls were inspected.—*Progress of Tuberculosis Eradication, J. A. Kiernan, J. Am. Vet. Med. Assn., October, 1926, lxx (n.s., xxiii), 28.—(H. S. W.)*

Tuberculosis of Swine.—Tuberculosis of hogs has actually increased in certain sections of the country while in cattle there has been a substantial decrease. The disease is thought to be due to avian tubercle bacilli and is even held by some to be an index of the amount of avian tuberculosis extant. It has also been transmitted from human beings to swine and from swine to swine, a circumstance that makes tuberculosis in swine a matter of great importance. There are very few data as to its true incidence. Clinically, it usually involves the lymph nodes tributary to the gastrointestinal tract and tends to be chronic unless infection is with the bovine bacillus. Its eradication among swine must also contemplate eradication among poultry and cattle.—*Swine Tuberculosis, E. L. Stubbs, J. Am. Vet. Med. Assn., October, 1926, lxx (n.s., xxiii), 26.—(H. S. W.)*

Human Tubercle Bacillus Isolated from Disease in Horse.—Autopsy on a horse, that had sickened and died, revealed caseation of all the lymph nodes, tumor-like growths as large as walnuts in the spleen, and multiple abscesses throughout the lungs. Smears of the pus-like material from the foci contained many acid-fast bacilli. Some of the material, when inoculated subcutaneously into guinea pigs, initiated tuberculosis in about thirty days. The animals died after injection of tuberculin, and acid-fast bacilli were found in smears from fresh lesions, from which they were also isolated on glycerine-agar. Other guinea pigs were inoculated with the tissue. The bacillus resembled the human type morphologically and this, added to the fact that the inoculated guinea pigs lived longer than fifty days, pointed to a human rather than a bovine strain.—*Tuberculosis Apparently of Human Type Found in a Horse,*

R. H. Mills, J. Am. Vet. Med. Assn., August, 1926, lxix (n.s., xxii), 631.—(H. S. W.)

Control of Tuberculosis in Poultry.—The poultry industry represents great wealth (in Illinois the farm flocks are valued at $30,000,000 and the annual production of poultry meat and eggs at $68,000,000). With the expansion of the industry there have come new diseases and new problems. It is much more economical to prevent than to cure disease of fowls, and care must always be had to the health of the flock rather than of the individual fowl. Sanitation and hygiene are fundamental considerations in prevention of disease. There are two diseases of poultry that are of the greatest importance, namely, white diarrhea and avian tuberculosis. As to the second, recent work has served to emphasize the importance of avian tuberculosis, both of itself and because swine and calves may suffer disease and death from avian infection. All infected flocks should be isolated. Every effort should be made to induce poultrymen to have their flocks tested with tuberculin just as herds are now tested. In Illinois, flocks are accredited or certificated in the same manner as herds. The issue must be met because in many parts of the middle West avian tuberculosis is coming to be one of the most serious and important issues in the control of tuberculosis.—*Poultry Disease Control, F. A. Laird, J. Am. Vet. Med. Assn., September, 1926, lxix (n.s., xxii), 717.—(H. S. W.)*

Tuberculosis in Marine Fishes.—Spontaneous tuberculosis in cold blooded animals has been noted in a ringed snake, a carp, turtles and a frog. Lesions associated with acid-fast bacilli have been described as occurring in a codfish and in a halibut. In neither case was the microorganism isolated. Tubercles were found in various organs of salt-water fish found dead in the tanks of the Philadelphia Aquarium and acid-fast bacilli were found in them. Nodules found in the liver resembled in some respects the tubercles of mammals, and masses of acid-fast bacilli were found in these nodules. In the spleen mycotic emboli were found in the blood vessels, and there was necrosis of the vessel-walls and splenic tissue. From these lesions were isolated an acid-fast, chromogenic, pleomorphic bacillus, which grows best at from 10°C. to 20°C., is pathogenic for pigeons, mice, goldfish and frogs, but does not kill rabbits or guinea pigs. The cultures isolated from these salt-water fish differ in antigenic character from the avian and mammalian varieties of *B. tuberculosis*, from acid-fast bacilli isolated from poikilothermic animals, and from saphrophytic acid-fast bacilli. The name *Mycobacterium marinum* is suggested for this microöganism.—*Spontaneous Tuberculosis in Salt Water Fish, J. D. Aronson, J. Infect. Dis., October, 1926, xxxix, 315.—(J. S. W.)*

German Conceptions of Pathological Anatomy.—In morphological descriptions there is no difference between French and German conceptions. The *forme folliculaire* and the *forme infiltré* of Letulle are for Aschoff the productive and exudative types. In Germany, as in France, the productive types bring about greater modifications of tissue structure, but they offer the best prognosis. Productive lesions are compared to the war of the trenches, where the ground is dug up and remade into powerful means of defense. By contrast the reaction of exudative lesions can be compared to the retreat which cedes to the adversary territory, whose fate, for the moment at least, remains uncertain. To study the fight between the bacilli and the microorganisms we must revert to the stage of primary infection. This may be congenital. The placenta is no longer considered an insurmountable barrier, and lesions have been demonstrated in it. But the frequency of tuberculous placental lesions is minimal compared with the number of phthisical mothers. The importance of the congenital mode of infection, the only one according to Baumgarten, is scarcely corroborated by the excellent results derived from separation of children from tuberculous mothers. It is possible to have bacilli in the bodies of the newborn without their giving rise to specific lesions. The frequency of this symbiotic "bacillary invasion," which Orth distinguishes from infection, remains to be determined. The result of primary infection with the bacillus is identifiable anatomically. It appears after birth. It is the "chancre of inoculation" of Küss, which the Germans call *Primärkomplex*. This chancre, when localized in the lung, is represented by a small focus, usually lobular, of "exudative" pneumonia, which is then surrounded by a "productive" capsule and possesses a marked tendency to caseation. Lymphatic involvment is the rule. The adenopathy often exceeds the parenchymal lesion in volume. The pathological process there is made up of epithelioid cells from the start; caseation then ensues; the congestive band which unites the two foci is studded with miliary nodules. Around the foci a nonspecific inflammatory zone will furnish, in the event of cure, a fibrous capsule, unusually less complete than

in other tuberculous lesions. The healed lesion, frequently calcified and even ossified, casts a very evident radiographic shadow. Such an evolution, however, is not limited to the primary complex. Its absolutely specific adenopathy differentiates it from other nodular foci. This chancre is most often on the right side and in any position except at the apex. Even when subpleural, it is not accompanied by serous exudate. The chancres may be multiple, evidences of simultaneous or quickly succeeding infections. They may be extrapleural. The chancre of inoculation is almost constant; Schürmann has found it in 96.17 per cent of autopsies. It is indeed the evidence of first contact with the bacilli, because no other tuberculous lesion is so constantly observed; also because the chancre exists without any other tuberculous lesion in 37.98 per cent of Schürmann's cases. The specific value of such manifestations permits, with some degree of precision, a discussion of the portal of entry and the routes of propagation of the bacilli. According to Schürmann, the primary complex existed in the lungs in 80.12 per cent, in the neck 1.99 per cent, in the axilla in 0.47 per cent. In 5.49 per cent it was met with in several organs at the same time. It has a twofold significance: it is a source of dissemination of bacilli in the body, and, secondly, it confers on the body a degree of allergy and relative immunity. Even when calcified and ossified the chancre may harbor living bacilli. This may be proved by animal inoculation and by the presence of recent productive nodules or exudative lesions around the chancre. Sometimes a vascular connective-tissue pedicle may penetrate the chancre and permit the bacilli to get out. But it is at its onset that the primary complex constitutes its greatest menace; the purulent mass may forthwith be converted into a lesion with cavity. This evolution is most frequently met with in the infant; resistance against the primary infection increases with age. The dissemination of bacilli, arising from the masses of the chancre at first by way of the lymphatics and then by the blood-stream, will constitute miliary tuberculosis. It is not certain that it results from rupture of caseous masses into a vessel. From the anatomical point of view it has been shown that this miliary tuberculosis may be as often productive as exudative. It is difficult to interpret the significance of one or the other form. It is not a question of response of the tissues to bacilli of different types of virulence. It does not seem that the exudative form is transformed secondarily into the productive nodules, because these facts would not tally with what we know of the histogenesis of tubercle. However, exudative types of miliary tuberculosis are more rapidly fatal than the productive types. It seems that the productive form is observed when there already exist active tuberculous foci. It would be an evidence of some degree of specific allergy. On the contrary, the exudative type exists when, besides the miliary tuberculosis, only healed or encapsulated lesions are present. Generalized miliary tuberculosis is unknown in chronic phthisis. Finally a nonspecific allergy must be considered. Ranke endeavors to explain the polymorphism of the lesions of tuberculosis on the basis of different states of the infected organism. He recognizes three stages: (1) the phase of primary infection, (2) the anaphylactic phase, the phase of hypersensitiveness and of generalization of the lesions, and (3) the allergic phase, stage of relative immunity and localization of the lesions. The first phase is that of the chancre, manifested morphologically by susceptibility of the body to the bacillus of Koch. The second stage shows, in addition to the pulmonary lesions characterized by the chancre, multiple tuberculous lesions in other organs. Generalized miliary tuberculosis is frequent and lymph-node involvment may be multiple, in relation to a focus in any organ. They present a rapid caseation without previous epithelioid-cell formation. Finally, to the specific lesions is added an intense perifocal congestion, comparable to that resulting from a tuberculin reaction; it is the mark of hypersensitiveness of the body. The development of metastatic foci is due to the spread of bacilli by the blood and lymph-stream. In the third stage the specific lesions are limited to the lung. These are those of chronic tuberculosis, and there is no metastasis to the lymph nodes or into other organs, and especially no generalized miliary tuberculosis. This is not due to lack of diffusion of the virus in the blood-vessels, because tubercle bacilli are often demonstrable in the blood in chronic phthisis. If the bacilli are not grafted upon the organs, it is only because the humors have acquired bactericidal properties and the disease can only progress when the virus is propagated without coming in contact with those humors; hence, the extension of phthisis by the bronchial and digestive-tract routes only. Tubercles in the liver and spleen, as found at autopsies, are due to a hematogenous dissemination shortly before death when the bodily defenses are broken down. In substance, the third stage is characterized by immunity of the organs and also by the decline of the defense against toxic products, when there is no longer perifocal congestion; hence, the importance

of general toxic disturbances in chronic phthisis. This conception of an immunity of the organs, which at first sight appears incompatible with the extensive destruction of the lung in phthisis, explains itself for Ranke by the intracanalicular mode of propagation and by the exogenous reinfections which can so readily take place in this organ. Several criticisms have been raised against this conception. Above all, it is strongly debatable if there constantly exists, before the stage of immunity, a stage of generalization so short and so efficacious as it seems to be. There is evidence to support Aschoff's view of just two stages, infection and reinfection. It is then a matter of knowing whether reinfection is caused by new bacilli or from the initial chancre. Ranke favors the view of endogenous reinfection, and the anatomical studies of Ghon favor this view. But anatomical proofs alone are insufficient. Clinicians for the most part favor the exogenous origin: phthisis is frequent in a tuberculous environment. Pathological anatomists, with Aschoff, draw arguments in the same sense from the localization of tuberculosis in a single lung. Beitzke stresses the apical localization of chronic phthisis. Bacilli coming from the outside can only lodge at the apex, because there the allergic defense of the body is poorest, owing to the deficient drainage. Huebschmann, more selective, distinguishes a phthisis, apical at the onset, of endogenous lymphohematogenous origin and an initial phthisis at the base of exogenous origin. He argues that bacilli coming from the outside always go to the base and never to the apex, as evidenced by the localization of the primary chancre. All these opinions are open to controversy. In short, the German authors endeavor to correlate the progress of tuberculous infection in man with that of other infectious diseases. This forces recognition of the same principal characters and of the conception of the different anatomical disorders, not only as a manifestation of the local fight between the bacillus and the body, but also the influence of the humoral modifications.—*L'anatomie pathologique de la tuberculose pulmonaire. (Conceptions des auteurs de langue Allemande), Meyenburg, Presse Méd., January 15, 1927, no. 5, 70.*—*(B. T. McM.)*

Types of Tubercles.—It is of practical, as well as of theoretical, importance to distinguish between "granulations" and miliary tubercles. The "gray granulation" of Bayle is composed of old fibrosed primitive follicles. The miliary tubercle and the "miliary granulation" of Laennec are entirely different things. The miliary tubercle is a small body, gray, semitransparent, sometimes colorless, hard, often larger than a grain of millet seed. The "granulation" is smaller, ovoid and transparent. Histologically, however, the two lesions were confounded for a long time. It was believed that all were composed of a conglomeration of primitive follicles. Tubercle bacilli injected intravenously into a rabbit produce innumerable granulations of the Laennec type, composed histologically of primitive follicles. If the injection is given intratracheally miliary tubercles result without giant cells. Miliary tubercles and lesions of bronchoalveolitis are the findings at autopsy on phthisical patients. Even in clinical generalized miliary tuberculosis the X-ray shadows, as also the macroscopic tubercles, are usually miliary tubercles of bronchogenic origin. The granulation (productive tubercle) is much rarer. Usually hematogenous and lymphogenous in origin, it is interstitial and composed of a mass of primitive follicles. However, lesions of alveolitis may be added around it. Strictly speaking, this pathological and anatomical division is not absolute; a miliary tubercle may be surrounded by granulation tissue with giant cells. According to Aschoff, the bronchogenic tubercle may have a productive structure. The only difference between the French and German theories lies in the comprehension of this productive bronchogenic tubercle. The acinous productive focus is characterized by a tendency to fibrosis, the sclerosis arising within the lesion. For the French this view is not accurate; but Aschoff attaches great importance to it and compares this lesion, with its tendency toward healing, with the exudative focus with its destructive tendency. There is evidence that the question of dosage is paramount. Few bacilli transmitted by the blood-stream produce generalized miliary tuberculosis. A few bacilli, transmitted by the bronchi, result in miliary tubercle with a tendency to fibrosis. Large numbers, introduced by the bronchial route, cause gross miliary tubercles or diffuse infiltrations.—*Granulation tuberculouse et tubercule miliaire, Bezançon and Braun, Presse Méd., January 15, 1927, no. 5, 72.*—*(B. T. McM.)*

Caseation in Tuberculosis.—The term caseation is applied to the gross characteristics of the necrotic material commonly seen in tuberculous infection. This necrotic tissue is easily removed, has no texture, and varies in consistence from thick pus to a crumbly material not unlike cottage cheese. The question is asked, why should the

necrotic tissue of the tuberculous differ from other forms of necrosis seen in the same tissues, as gumma and abscess. Tissues from human cases obtained at necropsy and at surgical operations, from guinea pigs inoculated with bovine and human tubercle bacilli, and from fowls naturally infected with the avian strain of the tubercle bacillus, have formed the basis of this study of caseation. To understand the natural sequence of events in the process of caseation a series of guinea pigs were inoculated subcutaneously with a small dose of human tubercle bacilli (H37) and, beginning with the tenth day after inoculation, animals were killed every fifth day, up to thirty-five days after inoculation. The bacilli are distributed throughout the body after being phagocytized by both the polymorphonuclear and mononuclear leucocytes. These, by their wandering proclivities, first gain access to the lymphatics and later to the blood-stream. In the resulting secondary foci of infection the processes leading up to caseation can be readily followed, and the pathological process, as it develops in the spleen, is described. The spleen is chosen on account of its size, and because its infection with tubercle bacilli is entirely hematogenous. In addition, it has no connection with the outside world, as do the lung and kidney, and consequently would be the least liable to be involved with infectious agents other than the one inoculated. At ten days the spleen shows no tubercle formation, although bacilli are already present in the organ. From this time on, the greatest development of the tuberculous process is in the Malpighian corpuscles, with later extension to the spleen pulp. Up to the twenty-five-day specimen there is an increase in the number of tubercle bacilli present, probably due to multiplication in the organ and to the continued accumulation of the bacilli filtered out of the blood-stream. The cellular reaction in the fifteen and twenty-day specimens consists almost entirely of mononuclear leucocytes. This is the mononuclear or "epithelioid" tubercle. Lymphocytes are very rare within the tubercle, but are numerous in the surrounding area. Polymorphonuclear leucocytes are also uncommon in the tubercle, but may be found in small numbers in the area outside the tubercle. There is as yet no evidence of caseation. Beginning in the twenty or twenty-five day specimen, one sees a gradual and increasing accumulation of polymorphonuclear leucocytes in the areas where caseation later becomes apparent. These areas are often near the centre of the tubercle. The accumulation of polymorphonuclear leucocytes now far overshadows the mononuclear infiltration, so that in many instances the inflammatory reaction resembles abscess more than it does tubercle-formation. Bacilli are still present. Many of the smaller foci now show the typical picture of caseation, and, if the dead cells are not too closely packed together, one can faintly make out the outlines of the nuclei of the polymorphonuclear leucocytes. These areas also contain a varying amount of nuclear dust. In lesions of six, seven or eight weeks' duration, the picture of caseation is present in many of the larger lesions. The necrosis appears to begin at the periphery of the most intense inflammatory reaction and gradually to proceed toward the centre. In the inflammatory process, as described, giant cells are not found. They do not appear to be an essential part of early tubercle formation in the guinea pig. Following the cellular reaction subsequent to caseation, it will be noted that polymorphonuclear leucocytes are not further attracted after caseation has been produced. Mononuclear leucocytes and lymphocytes continue to accumulate and they gradually invade the caseous mass. At this stage of the reaction giant-cell formation begins to take place. A study of natural tuberculous infection in the fowl showed that all the stages, leading up to the typical picture of caseation present in the guinea pig, could be easily demonstrated in the avian tissues. However, tubercle bacilli were found to be far more numerous in the latters' lesions than in either guinea-pig or human lesions. In the fowl the leucocyte, which corresponds to the neutrophilic polymorphonuclear leucocyte in man, has an abundance of eosinophilic granules, which makes for an easy recognition of these cells when they are massed together in the midst of a tubercle, for they take an intense eosin stain. This staining of the caseous material is much more intense than in man or the guinea pig, strongly suggesting the important part played by the polymorphonuclear leucocyte in the production of caseous material in the fowl. As in the guinea pig, the polymorphonuclear leucocyte does not appear to be attracted by the caseous mass after it is once produced. Giant cells are usually far more numerous than in human material or in guinea-pig tissues. The human material investigated yielded results closely similar to the above. The caseous material in man is composed in large part of dead polymorphonuclear and mononuclear leucocytes, but it appears that the bulk of the necrotic material is made up of the former. In the hyperplastic type of tuberculosis, polymorphonuclear leucocytes were found to be rare, as this type of tuberculosis rarely results in caseation. It is

apparent that the process is the same regardless of the type of tubercle bacillus causing the infection, or of the host infected. When caseation appears it is an indication of the virulence of the infection, or of the lack of resistance of the host, of the dosage, or of all three. When hyperplastic tuberculosis without caseation develops it is an indication of low virulence on the part of the bacillus, good resistance on the part of the host, small dosage, or a combination of these factors. Wherever it is possible, caseous material is extruded from the body, and cavitation (lungs) or ulceration (intestines) ensues. Where caseation occurs in a place, such as bone, where the caseous material cannot be extruded, a cold abscess will develop if the process is not successfully walled off. In case the material is successfully walled off, it will either become calcified or be organized, and a scar be produced. The term "mononuclear leucocyte" is the name applied to the ameboid phagocytic cell, which has to do with tubercle and giant-cell formation. It has been designated as the epithelioid cell, the wandering mononuclear phagocyte, the macrophage, the endothelial leucocyte, the polyblast and the monocyte, depending on the investigator. Whatever its name or origin, it appears to be the greatest single factor in the destruction of the tubercle bacillus that the body possesses. In the mononuclear or "epithelioid" tubercle the polymorphonuclear leucocyte is not seen until there is evidence of damage to the mononuclear leucocytes. Whether the polymorphonuclear leucocytes are attracted by the necrotic mononuclear leucocytes, by opsonins, by substances liberated through the death of the tubercle bacillus or by substances produced in the tissues by the multiplying of the bacilli, is not understood. There is also abundant evidence that the polymorphonuclear leucocyte is not attracted by caseous material after it is once formed. The destruction of the reticulum ordinarily produced in the tubercle is probably brought about by the polymorphonuclear leucocyte with its proteolytic enzyme. According to chemical analysis, a certain parallelism exists between the lipoid content of pus and the caseous material, which indicates that they are composed largely of the same cellular elements. From a study of the inflammatory reaction early in the process of caseation in the guinea pig, it is apparent that the polymorphonuclear leucocytes are injured before disintegration takes place. This early injury might explain why autolysis and softening do not take place in the process of caseation as in ordinary abscess. It also seems plausible that an acid reaction in the tubercle might be the cause for the failure of the leucocytes to bring about liquefaction as they do in a pyogenic infection. The presence of the polymorphonuclear leucocyte in tuberculous inflammation is not an indication of secondary infection with pyogenic bacteria.—*A Study of the Process of Caseation in Tuberculosis, E. M. Medlar, Am. J. Path., July, 1926, ii, 275.*—*(J. S. W.)*

Giant Cells and Caseation.—The presence of giant cells, especially of the Langhans type, together with mononuclear-cell tubercles, is considered sufficient evidence to warrant the diagnosis of tuberculosis in tissues, even if tubercle bacilli are not demonstrated. To understand the significance of the cell mass in the tubercular reaction, it would appear that two facts should be established. The first is the period in the reaction in which the cell is produced, and the second is the mode of its formation and constitution. The material which formed the basis of the present study is the same as reported in the author's previous article on caseation in tuberculosis. In the guinea pig a most striking feature in the developing cellular reaction to the tubercle bacillus is the absence of giant cells. The next feature of prominence is the very common occurrence of caseation. From this it would appear that these cells are not essential in the process of caseation. The mononuclear leucocyte plays the chief rôle in the production of the tubercle, the polymorphonuclear leucocyte in the production of caseation, and the mononuclear leucocyte and the lymphocyte in the disposing of the caseous material. It is in this later phase of the reaction, the period of caseation, that giant cells appear. They are found in areas in which the amount of necrosis or of caseation has been small and not in the areas where such destruction has been extensive. It would seem that the ground-substance or matrix of these cells is a small area of necrotic or caseous material. The peculiar arrangement of the nuclei in the periphery of the cell appears to be due to the migration of the mononuclear leucocytes into the upper periphery of the dead tissue. When mononuclear leucocytes accumulate in sufficient numbers, the picture of a giant-cell tubercle is produced. Fowl tissues show much more strikingly the process of such cell formation. The intense eosin staining of the caseating mass makes a striking color contrast with the hematoxylin staining mononuclear leucocytes surrounding it. These leucocytes are also numerous in the tissues adjacent to the caseating material and there is evidence that they wander into it. Another finding of interest in avian tissues is the presence

of from two to a dozen or more giant cells in close proximity to one another. It would seem that these areas were originally relatively small areas of caseation, which for some reason have been broken up into smaller units. These units have then been surrounded and invaded by mononuclear leucocytes, thus forming giant cells. On tracing these areas through in serial sections, it was found that many of these cell masses were continuous with an area of caseous material which might not contain any nuclear structures. Large numbers of tubercle bacilli could be demonstrated in many of the giant cells, both in the necrotic area and in the nuclear zone. In the human being giant cells were more commonly found in old lesions, and seem to be associated with chronic disease. These cells are but seldom found in close relation to large areas of caseation, but are usually associated with small areas of necrosis. Giant cells are extremely rare in hyperplastic tuberculosis, where there is little evidence of necrosis or caseation. Giant cells show striking variations in size, shape and nuclear content. They vary from 30 to 300 micra in thickness and are very irregular in outline, although more or less spheroidal or lenticular in shape. The number of nuclei varies at different levels, although the whole cell mass may show from less than 100 to more than 1,000. Two types of nuclei are often present, those of the mononuclear leucocyte, which predominate, and those of the lymphocyte which are present in small numbers. In some cases of pulmonary tuberculosis associated with anthracosis, black pigment is found in the giant cells. This pigment is always closely associated with the nuclei. It would seem that the pigmentation of these cells has been brought about by the invasion of dead tissue by too many pigment-containing mononuclear leucocytes. At the present time there are two theories as to giant-cell formation. One is the original conception of Weigert that such cells are formed by the continued nuclear division, without division of the cytoplasm, of a single cell. Cunningham, Sabin, *et al.*, believe the cells to be formed by the continued amitotic division of the monocyte. The other theory is that the cell is formed by the fusion of many "epithelioid" cells. It is also generally taught that giant-cell formation precedes caseation, and that it becomes involved in and destroyed by this process. The findings presented in this study would seem to place in a different light the time and mode of production and the function of the so called giant cells. It seems quite certain that this formation does not precede small areas of caseation or necrosis. This would place the cell late in the tubercular reaction or in the reparative stage of the disease. Why the cells should not penetrate further into the dead tissue in the case of the Langhans type of cell is not clear. It may be due to lack of chemotoxins, or the compactness of the material may impede further progress. The theory of giant-cell formation from a single cell seems to be incompatible with the evidence cited above. Whether the cells fuse after they wander into the dead tissue seems impossible of determination, and is really of minor importance. The function of the giant cell is apparently to digest or remove in some manner the dead tissue. Dead material should constitute no part of a true giant cell. Such giant cells are those seen in the most malignant types of neoplastic growths. *Conclusions:* Giant-cell formation in avian, bovine and human tuberculosis appears to be brought about in a similar manner. Giant cells are indicative of a reparative process in small areas of caseation or of simple necrosis of tissue—a reaction to a foreign body. Giant cells in tuberculosis are not true giant cells. They are bits of dead inflammatory tissue which have been more or less completely surrounded and invaded by mononuclear leucocytes, less commonly by lymphocytes and very rarely by polymorphonuclear leucocytes.—*Giant Cells and Their Relation to Caseation in Tuberculosis, E. M. Medlar, Am. J. Path., July, 1926, ii, 291.*—(*J. S. W.*)

Vascular Changes in Caseous Pneumonia.—The changes in the small blood-vessels, of 20 to 100-micra diameter, were studied in 40 cases of varied nature. In all cases there occurred a proliferation in the adventitia, with the presence of lymphoid and plasma cells, fibroblasts, leucocytoid wandering cells, and at times an increase of the connective-tissue fibres. In the intima there was lymphoid, plasma and wandering-cell infiltration, which extended into the lumen. Edema of the walls and slight infiltration can cause an occlusion with caseation. There can occur an extension of capillaries from the adventitia into the intima. At times necrosis can extend into the lumen through the intima without accompanying cellular reaction. In almost all the arteries there was a cellular proliferation of the adventitia. Intimal changes usually take place only after caseous changes of the adventitia. The most frequent change is an invasion of granulation tissue from the adventitia into the intima through the elastic membrane; at times, with newly formed elastic fibres. With a marked deposition of fibrin in the intima, a thromb-arteritis may result. The veins become

occluded more rapidly than the arteries. The inflammatory granulation tissue is believed to originate from the adventitia. On the whole, there exists a fairly uniform correlation between the type of vascular change and the course of the pulmonary process. Slow and moderately rapid processes exhibit occlusion of the small arteries and veins by granulation tissue, with subsequent caseation. A more rapid process presents either no vascular reaction or a slight endangitis, with rapid caseation of the blood-vessels. In very slow processes the narrowing of the lumen was rarely indicated by an overgrowth of granulation tissue. In rapid cases the deposition of large masses of fibrin was limited to the endothelial lining of the larger vessels.—*Gefässveränderungen bei käsiger Pneumonie, T. Konschegg, Virchow's Arch. f. pathol. Anat., 1926, cclx, 140.*—(*H. J. C.*)

Biology of Giant Cells.—The central apparatus of the giant cell described by Herxheimer and others is considered to be pyknotic nuclear remnants. Besides numerous giant cells of the Langhans type, with peripheral nuclei, there were four cases in which the nuclei were centrally located. In these cells the central nuclear part is surrounded by a rim of free nuclear plasma containing individual lymphocytes. The following stages are given for giant-cell formation: A liquefaction of centrally located epithelioid cells as the result of the tuberculotoxin (stage of primary cell destruction), the injured nuclei are stimulated to marked proliferation (the stage of growth), cell and nucleus caseate (the stage of caseation), complete necrosis, dissolution (the stage of complete necrosis), or healing, calcification, etc. The giant cell usually occurs in the centre of the tuberculous nodule. Well preserved, numerous giant cells signify progression, and their absence healing or arrest of the process.—*Beitrag zur Lehre der tuberkulösen Riesenzellen, G. Bakacs, Virchow's Arch. f. path. Anat., 1926, cclx, 271.*—(*H. J. C.*)

Tuberculous Pulmonary Cavities.—Physical examination without a radiological study cannot exclude the presence of cavities in the lungs. It is also erroneous to denote a cavity as silent on radiographic evidence alone. The patient should be examined at frequent intervals, since physical signs vary. There are many cavities that escape detection even by X-ray. Auscultatory signs prevail over cavities resulting from an exudative process, while the cirrhotic cavities are more easily detected by X-ray. The spontaneous healing of cavities is not rare, and often occurs unexpectedly. Vigilance is necessary in all cases, in order to institute pneumothorax therapy at an opportune time and not to allow the cavity to grow too large. Thin-walled cavities respond best to artificial pneumothorax. Thoracoplasty usually meets with the disfavor of patients. Phrenicotomy should be considered in basal cavities.—*Le caverne tubercolari del polomone, D. Sartori, Tubercolosi, September, 1926, xviii, 301.*—(*U. E. Z.*)

Type of Tissue Change in Rapid Cavity Formation.—In a case of pulmonary tuberculosis, in which the entire left upper lobe was transformed into a cavity, the lobular formation remained intact, and the larger vessels were preserved. This is reported as an extremely rare type of tissue destruction in tuberculosis.—*Ein seltenes pathologisch-anatomisches Bild bei rapider Kavernenbildung, F. Kellner, Beitr. z. Klin. d. Tuberk., 1926, lxiii, 141.*—(*H. J. C.*)

Significance of Open Pulmonary Tuberculosis.—Open tuberculosis was studied from the standpoint of prognosis rather than infectiousness. It must be clearly understood that the determination of the open forms of pulmonary tuberculosis to a great extent depends upon the possibilities and conditions of examination, and that the sanatorium figures are too low, considering the actual frequency of bacillary findings. The material, 250 cases, in which, during the last few years, tubercle bacilli had been found once, was divided into six groups according to the appearance and disappearance of the bacilli, and analyzed into the following four more exact divisions: *1:* Cases which were found positive immediately and persisted so. These were almost exclusively moderately advanced or advanced cases, with only a slight tendency to fibrosis and a common tendency toward exudative processes. Two-thirds began before the thirtieth year. The prognosis is bad (53 per cent fatal and 14 per cent able to work). *2:* Cases which were found to be immediately positive and then became negative. These proved to be predominantly moderately advanced and advanced cases, with a tendency toward fibrosis. Less than half developed the disease before the thirtieth year. The prognosis is good (91 per cent able to work and no deaths). *3:* Cases which only became positive at a later period but remained so afterward, in which case they proved to be predominantly advanced or moderately advanced cases, with a marked tendency toward fibrosis. Over one-half developed the disease before the twenty-fifth year. The

prognosis is better than in group 1 (40 per cent mortality and 22 per cent able to work). *4:* Cases that became positive and then became negative and remained so, these being predominantly advanced or moderately advanced cases, in over one-half predominantly fibrotic and only rarely exudative. Half of the cases were between 25 and 35 years old. The prognosis is good (90 per cent capable of work and no deaths). The more advanced the age when the sputum became positive the more favorable was the outlook and the greater the possibility of the bacilli disappearing again. Among these cases two-thirds were open at the beginning, while the remaining third changed from closed to open tuberculosis. Of all the open cases developed, a third again became closed. After sanatorium treatment 48 per cent remained open and 52 per cent became closed. It is not so important whether an open or closed tuberculosis exists, as to whether this open case becomes closed. Likewise the extent of the process is not of so great importance in prognosis as the tendency toward fibrosis.—*Offene und geschlossene Lungentuberkulose, J. E. Kayser-Petersen, Beitr. z. Klin. d. Tuberk., 1926, lxiii, 503.*—*(H. J. C.)*

Duration of Disease in Advanced Pulmonary Tuberculosis.—The average duration of "tertiary" pulmonary tuberculosis is 4.2 years, of which 2 years are passed in the third stage. The duration lengthens with increasing age and with sanatorium treatment. Sanatorium residence becomes prolonged 50 to 100 per cent if it is repeated in advanced cases. A large percentage of these cases can temporarily be returned to work, the relative duration of sanatorium residence to working period being one to two.—*Über die Krankheitsdauer der tertiären Lungentuberkulose III Grades und ihre Beziehung zum Tuberkulose-Krankenhaus, Harms and H. Wangrin, Beitr. z. Klin. d. Tuberk., 1926, lxiii, 467.*—*(H. J. C.)*

Ranke's Primary Complex.—Observations on a thousand postmortem cases, from 0 to 91 years of age, for the presence of the primary complex are presented. In 88.9 per cent anatomical tuberculosis was found, the percentage being lower prior to the eighteenth year (57.95 per cent) and higher afterward (97.56 per cent). In 96.17 per cent of the cases with anatomical tuberculosis there was a typical primary complex. In the remaining 3.83 per cent, in which the primary complex was not determined, there was no absolute evidence of its absence. In 91.69 per cent the primary focus was single and in 8.13 per cent multiple; and in 3.51 per cent of these in a form and localization which made it impossible to determine whether one or more organs were the portal of entry. The lung, with 80.12 per cent, stood in marked contrast to the 15.32 per cent of extrapulmonary portals of entry. The associated lymph nodes were not caseated in 0.58 per cent, and caseated in 4.91 per cent; in 6.31 per cent there existed old caseous or caseocalcareous foci, and in 73.21 per cent stony calcified lymph-node processes. In 5.37 per cent there were lymph-node exacerbations. In 9 cases, in people over 50 years of age, there were definite exogenous reinfections and also two primary complexes determinable. An interesting case occurred in a 72-year-old man in whom there was found, besides an old-age primary complex in the lung, a fresh new primary complex in the vicinity of an efferent lymphatic which led to a fresh generalization. In a smaller percentage it was difficult to differentiate whether there existed a genuine reinfection or a lymph-node exacerbation. Conclusions as to the relation of tertiary phthisis to the spread of the primary complex did not seem justified since there were certain cases which were contradictory.—*Der Primärkomplex Rankes unter den anatomischen Erscheinungsformen der Tuberkulose, P. Schurmann, Virchow's Arch. f. path. Anat., 1926, cclx, 664.*—*(H. J. C.)*

Primary Complex and Reinfection in Lung.—Examination of 22 tuberculous primary complexes, lymph-node foci and "reinfections," verified earlier contentions, especially regarding the differentiation of the primary complex and the "reinfection," and the exudative character of the primary lesion.—*Untersuchungen über den primären tuberkulösen Komplex unter besonderer Berücksichtigung der Reinfektion der Lungen, H. Siegen, Beitr. z. Klin. d. Tuberk., 1926, lxiii, 143.*—*(H. J. C.)*

Reinfection in Tuberculosis.—In round numbers, one person in every 250 in Germany has tubercle bacilli in his sputum, and this explains why 60 per cent of school children are infected with the bacillus. An intense initial infection, however, is a helpful thing, because it furnishes a substantial protection against subsequent reinfection. Hence the great discrepancy between the incidence of infection and the incidence of disease, particularly in adults. Is adult tuberculosis, then, from an external or an internal infection? Adherents of the two ideas represent extreme points of view. It must be clear that both modes of infection

are possible; that adults may be infected by bacilli from without and from within. On the other hand, it is obvious from many roentgenograms that there are frequent instances of old infection at the base or hilum, and that in these there may be evidence of fresh disease. These latter are probably autogenous reinfections, and, if the lungs are rayed after removal from the body, such evidences are much more frequently found. Clouding of the apical field is supposed to represent an infection from without, but, as a matter of fact, it is quite easy to overlook a primary focus in such regions, and it may be that many of these areas of clouding simply mask the primary focus. It would seem that instances of endogenous reinfection are more common than exogenous. It is equally likely, however, that exogenous foci very commonly occur, if one is to judge from the roentgenogram. Both adults and children should be protected against infection with tubercle bacilli.—*Ueber die tuberkulöse Reinfektion, F. Ickert, Deutsche med. Wchnschr., January 7, 1927, liii, 57.*—(*H. S. W.*)

Apical Location.—Fresh infiltration in adult tuberculosis is common to both the chronic and acute forms of the disease, and in most cases the areas are located infraclavicularly and deep, although they may occasionally be at the apex, and adult tuberculosis does not necessarily develop from an apical focus. The disease may be divided into primary, secondary and tertiary stages.—*Ueber das "Frühinfiltrat" und die Inlehre vom gesetzmässigen zusammenhang der sogenannten Spitzentuberkulose mit der Erwachsenphthisie, F. Redeker, Deutsche med. Wchnschr., January 14, 1927, liii, 97.*—(*H. S. W.*)

Routes of Bronchogenic Metastases in Pulmonary Tuberculosis.—In the roentgenological examination of a large series of cases of pulmonary tuberculosis it was noted that the bronchogenic spread followed more or less definite and uniform paths. If the focus is in the right apex the spread occurs most frequently to the base of the right upper lobe, less frequently to the centre and the base of the left upper lobe, and least to the dorsal part of the right middle lobe. If the focus is in the left apex the spread occurs most frequently to the central dorsal part and less frequently to the base of the left upper lobe; a spread to the contralateral side is much more rare. It is evident from these observations that a right-sided apical lesion has much more tendency to a contralateral aspiration than a left-sided one. In case of hemoptysis the aspiration occurs most frequently to the lower lobe of the bleeding side because the bacilliferous blood is less dependent upon the air-currents within the bronchial tree and more on mere gravity. Contralateral aspiration in hemoptysis is very rare. It was observed only three times, each time from the right upper to the left lower lobe. These observations emphasize Neumann's advice that the axillary regions should be examined with particular care, and they would indicate that the establishment of a therapeutic pneumothorax should be less delayed in right-sided lesions.—*Die bevorzugten Metastasenstellen der bronchogenen Phthise (Stadium III, organbeschränkte Phthise Ranke, Phthisis fibrocaseosa Neumann), F. Fleischner, Wien. klin. Wchnschr., November 11, 1926, xxxix, 1330.*—(*M. P.*)

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